National Aeronautics and
Space Administration

Instrumentation

Portable and Compact Aerosol Sensor

For early warning fire detection and monitoring of health and public safety hazards

NASAs Glenn Research Center is offering a compact and versatile aerosol sensor for measuring, characterizing, and monitoring atmospheric particulates. Originally developed for early warning fire detection on the International Space Station, the sensor is useful in confined, high-risk environments, such as submarines, aircraft, and factories, where a fast and informed response can save lives. The device can also be configured to be worn as a personal monitor, enabling first responders, firefighters, hazardous material (HAZMAT) personnel, and other public safety officials to manage their exposure to hazardous breathing conditions. Lightweight and compact, the sensors can also be networked together at low cost to monitor large aerosol clouds and provide critical health and respiratory information for widespread disaster assessment and monitoring.

BENEFITS

- Accurate: Provides accurate results over a large range of aerosol parameters
- Versatile: Measures multiple aerosol properties, and several sensors can be networked to monitor large, distributed aerosol clouds
- Portable: Monitors an aerosols respiratory health effects when used as a wearable device
- Compact: Is roughly the size of a deck of cards
- Sensitive: Achieves a high level of sensitivity and reduces the occurrence of false alarms in fire detection
- Rugged: Can be used in harsh, confined, or remote field applications
- Low power consumption: Offers low power requirements

technology solution

THE TECHNOLOGY

Originally developed for early warning fire detection, this portable aerosol scattering sensor provides highly accurate aerosol measurements that can also be used to assess the environment for pollutants, emissions, or respiratory health hazards, protect HAZMAT crews and firefighters during clean-up efforts, and enhance public safety.

The underlying technology is a scattering photometer that relies on the interaction of light and aerosol material. In its present configuration, the sensor measures the total mass and total surface area of an aerosol cloud. The photometer measures light that is scattered from an ensemble of particles (as opposed to single particle counting) and provides critical, integrated information about this distribution of particles, such as total aerosolized mass, total aerosolized surface area, and total volume. The innovators have developed both a sensor and a computational tool that can be used to configure and optimize such sensors for advanced applications. This lightweight, low-power aerosol sensor is compact and portable enough to be worn as a personal monitor during field work, enabling a wide variety of new field applications. The sensors ability to accurately measure the total surface area of an aerosol has enormous potential for monitoring and protecting respiratory health, as few instruments currently exist for this purpose. These sensors can be networked together across a large area, allowing scientists, engineers, and public health officials to quantify the physical nature of the aerosol and provide critical information about potentially hazardous environmental conditions. In this way, personnel involved in large-scale clean-up efforts could monitor air quality in real time and thereby diminish or avoid long-term health effects from exposure to dangerous aerosols.

Sensor may be used to monitor respiratory health

APPLICATIONS

The technology has several potential applications:

- Early fire detection
- Respiratory health monitoring
- Environmental monitoring
- Pollution monitoring
- Emissions control
- Homeland security

PUBLICATIONS

Patent Pending

More Information

National Aeronautics and Space Administration

Technology Transfer Office

Glenn Research Center

21000 Brookpark Road
Cleveland, OH 44135
216-433-3483
ttp@grc.nasa.gov

http://technology.nasa.gov/

www.nasa.gov

NP-2015-04-1496-HQ

NASA's Technology Transfer Program pursues the widest possible applications of agency technology to benefit US citizens. Through partnerships and licensing agreements with industry, the program ensures that NASA's investments in pioneering research find secondary uses that benefit the economy, create jobs, and improve quality of life.

LEW-18634-1